# MODERN MATHEMATICS IN THE COMPREHENSIVE HIGH SCHOOLS AND SELECTED JUNIOR HIGH SCHOOLS IN KANSAS

by

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# INTRODUCTION

The Russians launched their Sputnik I in October of 1957. It is the mistaken idea of many that this event started the movement to improve the science and mathematics in our schools.

It was no secret that the mathematics offered in our schools did not meet the needs of our modern society, for as early as 1951 the University of Illinois Committee on School Mathematics started their study of secondary school mathematics. In 1955 the Commission on Mathematics was formed to study the training needed by our mathematic teachers, and the same year the Ball State Experimental Program was launched.

The fact that these studies and programs were in progress before Sputnik is evidence that Sputnik was not the reason for the study and change which resulted in the Modern Mathematics programs.

> Space Missiles are only symbols of the great explosion of the twentieth century of scientific knowledge. One of the most important factors contributing to this explosion is the revolutionary advance in both the development and the use of mathematics.[1]

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[1]Kenneth E. Brown, "Improved Programs in Mathematics Require Inservice Education for Teachers," The Mathematics Teacher, 54:85-90, February, 1961.

## PURPOSE OF THE STUDY

This study was designed to obtain information concerning the status of modern mathematics programs in the State of Kansas. Specifically the purposes were to:

1. Determine the extent to which modern mathematics is being offered.
2. Ascertain the training of the teachers in modern mathematics.
3. Determine the forces motivating the change.
4. Discover how long modern mathematics has been in the curriculum and the method by which it was introduced.
5. Discover at what grade levels Modern Algebra I and II and Modern Geometry are placed in the curriculum.

## PROCEDURES FOLLOWED IN PROBLEM

In this study the term modern mathematics will be used in reference to the concepts and methods of presenting concepts in mathematics recommended by Study Groups and National or University Committees as best satisfying the needs of our modern society.

To obtain the information presented in this study a questionnaire consisting of twenty-five items was sent to

the seventh comprehensive high schools listed in the Kansas Educational Directory, 1963-64, and to fifty-six junior high schools within these systems. The questionnaires were sent to a maximum of three feeder junior high schools for any one comprehensive high school system.

There were a total of 126 questionnaires distributed. Ninety-five, or 75.4 per cent, were answered and returned for compilation. There was no follow-up made on the original mailing, since schools had been assured of anonymity. After the returns were compiled six more completed questionnaires were received, but they were not included in this report.

Although the questionnaires were mailed to the principals of the high schools and junior high schools, two letters were included, one addressed to the principal and the other to the mathematics teacher selected by the principal to aid in answering the questionnaire. The questionnaire was mailed to the principals of the schools for two reasons, one as a courtesy to the administration and the other to assure that the questionnaire would reach the person best qualified to answer the questionnaire. Copies of the letters and of the questionnaire can be found in Appendix A.

The questionnaires were answered by mathematics teachers, principals, and curriculum directors. There were

indications that most of the questionnaires were completed by mathematics teachers, since most of the persons who requested summaries were mathematics teachers.

The data were analyzed, presented, and summarized in the report.

## REVIEW OF LITERATURE

There has been much study, discussion, and writing about the mathematics curriculum; and these studies, discussions and writings have been an important factor in the modern mathematics curriculum. Modern mathematics does not consist of any startling new concepts, but only concepts that have been known by mathematicians for many years. Moise stated:

> We should, at the outset, understand that methods and spirit of modern math does not mean recently discovered theorems. The program recommended by the commission did not include in grade 9-11 a single topic that was not well understood in the year 1800.[1]

The change in our school mathematics was brought about by a number of important changes in our modern society, and by our fast changing economy. This fact was recognized by many of our mathematicians. Brown has said,

> Not only are new requirements being placed on mathematics in the fields of physics, chemistry, and

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[1] Edwin Moise, "The New Mathematics Program," The Educational Digest, 28:28-31, September, 1962.

> engineering, but in other fields mathematics is being put to new and even more astonishing uses.
>
> The biologist is applying mathematical theory to the study of inheritance; industry is using mathematics in scheduling production and distribution; the social scientist is using ideas from modern statistics; the psychologist is using mathematics of game theory.[1]

Because of newer uses of mathematics it has been necessary for mathematics teachers to place stress on areas of mathematics different than the areas formerly taught. There is much more to mathematics than just problem solving, and the modern mathematics was planned to meet this need. Brown stated:

> The role of mathematics is not only to grind out answers to engineering problems, but to produce mathematical models (prototypes) that forecast the outcome of social trends and even the behavioral changes of the group. Such important new uses and interpretations of mathematics require that students have a program with a greater depth than classical programs designed for nineteenth-century education.[2]

From the preceding statement one can readily understand the need for the change in our mathematics curriculum. The questions which had to be answered were "What changes need to be made in the mathematics curriculum?" and "At what grade level should these changes be made?" Macduffee stated:

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[1]Kenneth E. Brown, "Improved Programs in Mathematics Require Inservice Education for Teachers," The Mathematics Teacher, 54:85-90, February, 1961.

[2]Ibid.

> There is little question in the minds of all of us regarding what we want to accomplish. We wish to bring the modern point of view into the high school and the first year of college. We cannot afford to discard the basic theorems in the traditional subjects--arithmetic, algebra, geometry, trigonometry and the calculus--but this standard curriculum should be modernized to include something of logic, set theory, and possible topology and abstract algebra. The debatable questions concern how much this new material should be stressed and how fast it can be presented.[1]

The above quotation is in agreement with the proposals of the College Entrance Examinations Board's Commission on Mathematics as stated by Hlavaty:

> The Commission formulated and proposed a nine point program for college-capable students:
>
> 1. Strong preparation, both in concepts and in skills for college mathematics at the level of calculus and analytic geometry.
>
> 2. Understanding of the nature and role of deductive reasoning--in algebra; as well as in geometry.
>
> 3. Appreciation of mathematical structure--for example properties of natural, rational, real and complex numbers.
>
> 4. Judicious use of unifying ideas--sets, variables, functions and relations.
>
> 5. Treatment of inequalities along with equations.
>
> 6. Incorporation with plane geometry of some co-ordinate and space perception.
>
> 7. Introduction in grade eleven of fundamental trigonometry--centered on co-ordinates, vectors, and complex numbers.

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[1] C. C. Macduffee, "Mathematics Curriculum in Perspective," The Mathematics Teacher, 52:265-67, April, 1959.

8. Emphasis in grade twelve on elementary functions.

9. Recommendation of additional alternatives units for grade twelve: either introductory probability with statistical application or an introduction to modern algebra.[1]

Inclusion of modern mathematics in the curriculum created the new problem of determining who would teach the new mathematics. It has been shown previously that there were really no new concepts for mathematicians involved, but instead there was a new emphasis. However, for teachers who were not mathematicians, some of the concepts were new. Because of the change in emphasis and possible new concepts, teachers had to be trained to teach the modern mathematics. The problem as stated by Adler was:

> There is now a vigorous movement underway to re-examine and modify the teaching of mathematics. The answered proposal of this movement is to bring the teaching of mathematics up-to-date by taking into account the changes that have taken place in mathematics.[2]

The National Science Foundation has been very active in helping to retrain some of the mathematics teachers by providing inservice opportunities for the teachers of mathematics and science. The Foundation has provided financial support for the Academic Year Institutes, Summer

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[1]Julius H. Hlavaty, "Mathematics in Transition," The Mathematics Teacher, 52:265-67, April, 1959.

[2]Irving Adler, "The Changes Taking Place in Mathematics," The Mathematics Teacher, 55:441-51, October, 1962.

Institutes, and Inservice Institutes. These institutes have been supported by the National Science Foundation since the mid 1950's.

Another one of the problems which was included in the study, concerned the courses and where they should be placed in our mathematics curriculum. The mathematics courses and the sequence of these courses have long been points for differences of opinion among mathematics teachers. Most teachers agree that geometry should logically follow Algebra I in the mathematics curriculum, but teachers' opinions as to the type of advanced mathematics courses which follow geometry and the sequence of these courses varied widely in the different school systems.

A study to determine the sequence in which the courses were placed in the mathematics curriculum was made in thirty-six large cities in the United States. In this study Burns and Frazier reported the following:

> A definite placement pattern has evolved for first year algebra and plane geometry. Even though this pattern is not universally followed, there appears to be a clear requirement that at least one year of algebra is basic to achievement in plane geometry and that plane geometry is prerequisite to a full understanding of most advanced mathematics courses.
>
> There is no uniform pattern of sequence for the advanced mathematic courses.[1]

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[1]Richard F. Burns, and Alexander Frazier, "Sequence and Range of High School Mathematics," The Mathematics Teacher, 50:562-66, December, 1957.

The work that has been done by the study groups and committees on mathematics has forced the schools to awaken to the problems that face them in their mathematics curriculum. There is much to be done before we find the final product, if there is such an answer, in our ever changing modern society. Moise expressed his doubts by saying:

> I cannot believe that anybody has found the final answer to any of our problems. I cannot even believe that such final answers exist. But the progress made in the past few years form the basis of a long overdue revolution in mathematical education, and I am convinced that even better work is soon to come.[1]

## RESULTS OF STUDY

One hundred twenty-six questionnaires on modern mathematics were distributed and of these ninety-five, or 75.4 per cent, were answered and returned for compilation.

The responses to item 1 of the questionnaire showed that seventy-four, or 77.9 per cent, of the responding schools had modern mathematics in their curriculum. The remaining twenty-one, or 22.1 per cent, indicated they did not have modern mathematics in their curriculum. Therefore, these twenty-one questionnaires were excluded from any further consideration in the tabulations for this report.

The answers given to item 2 of the questionnaire

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[1] Edwin Moise, "The New Mathematics Program," The Education Digest, 28:28-31, September, 1962.

revealed that the largest single influence motivating the change to modern mathematics was the mathematics teacher. Table I shows that in twenty-five, or 33.8 per cent, of the schools the mathematics teachers were the sole influence in the change to modern mathematics. In thirty-six, or 48.8 per cent, of the schools the mathematics teacher together with the school supervisory personnel were responsible for the change; therefore, the mathematics teacher was involved in a total of sixty-one, or 82.6 per cent, of the schools in planning the change in the mathematics curriculum. Table I shows that the supervisory personnel without the influence of the mathematics teacher were responsible for the change in nine, or 12.2 per cent, of the schools. There were two, or 2.7 per cent, of the schools where a mathematics committee was responsible for the change to modern mathematics.

Item 3 of the questionnaire asked, "Was an outside pressure group responsible for the change to modern mathematics?" An overwhelming sixty-nine, or 93.2 per cent, replied, "No." The five, or 6.8 per cent, who replied, "Yes" were requested in item 4 to cite the group most responsible for the change to modern mathematics. Colleges were cited in three, or 4.1 per cent, of the questionnaires as the reason for the schools changing their mathematics curriculum. In one, or 1.4 per cent, the National Science

TABLE I

PERSONS PRIMARILY RESPONSIBLE FOR MOTIVATING THE CHANGE TO MODERN MATHEMATICS

| Persons responsible | Number of teachers | Per cent |
|---|---|---|
| Mathematics teachers alone | 25 | 33.8 |
| Supervisory personnel & mathematics teachers | | |
| Principal of senior high school and mathematics teacher | 10 | 13.5 |
| Curriculum directors and mathematics teachers | 6 | 8.1 |
| Superintendent of schools and mathematics teachers | 4 | 5.4 |
| Superintendent, principal, curriculum director and mathematics teacher | 4 | 5.4 |
| Mathematics supervisor and mathematics teacher | 3 | 4.1 |
| Principal of junior high school, curriculum director and mathematics teacher | 3 | 4.1 |
| Superintendent, principal of senior high school and mathematics teacher | 2 | 2.7 |
| Principal of junior high school and mathematics teacher | 2 | 2.7 |
| Superintendent, curriculum director and mathematics teacher | 1 | 1.4 |
| Coordinator of mathematics, principal of senior high school and mathematics teacher | 1 | 1.4 |
| Total | 36 | 48.8 |
| Supervisory personnel without mathematics teacher | | |
| Head of mathematics department | 3 | 4.1 |
| Principal of junior school | 2 | 2.7 |
| Curriculum director | 2 | 2.7 |
| Superintendent of schools | 1 | 1.4 |
| Principal of junior high school and curriculum director | 1 | 1.4 |
| Total | 9 | 12.3 |
| Mathematics committee | 2 | 2.7 |
| College mathematics faculty | 1 | 1.4 |
| None listed | 1 | 1.4 |
| Total of all personnel | 74 | 100.4 |

Foundation Institutes were responsible for the change; also, one, or 1.4 per cent, school indicated that it was a combination of influences from colleges and publications that was responsible for the change to modern mathematics.

From the responses to item 5 it was found that the School Mathematics Study Group (SMSG)[1] was the greatest influence on the modern mathematics curriculum. The extent of the influence of this group and other groups and committees is shown in Table II. In fifty-four, or 73.0 per cent, of the schools the SMSG was the most influential factor in the change to modern mathematics; also, in nine or 12.2 per cent, the SMSG was cited in conjunction with one or more study groups or committees as the influencing factor. Thus the SMSG was cited by sixty-three, or 85.2 per cent, of the schools as having influenced their change to modern mathematics. While the University of Illinois Committee on School Mathematics (UICSM) influenced only two, or 2.7 per cent, of the schools to introduce modern mathematics into their curriculum.

To determine the school years in which modern mathematics was introduced into the mathematics curriculum, item 6 was included in the questionnaire. The responses to item

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[1]Note: This abbreviation is commonly used in literature and will be used throughout this report, as will the abbreviations for other well-known groups.

TABLE II

STUDY GROUPS OR COMMITTEES WHICH INFLUENCED MODERN MATHEMATICS CURRICULUMS

| Study groups or committees | Number of schools | Per cent |
|---|---|---|
| School Mathematics Study Group SMSG . . . | 54 | 73.0 |
| School Mathematics Study Group in conjunction with other study groups | | |
| School Mathematics Study Group and College Entrance Examinations Board's Commission on Mathematics . . . . . | 3 | 4.1 |
| School Mathematics Study Group and University of Illinois Committee on School Mathematics . . . . . | 3 | 4.1 |
| School Mathematics Study Group Boston College Mathematics Project, and College Entrance Examination Board's Commission on Mathematics . . . . . | 2 | 4.1 |
| School Mathematics Study Group and Ball State Teachers College Experimental Project . . . . . | 1 | 4.1 |
| Total . . . . . | 9 | 12.2 |
| University of Illinois Committee on School Mathematics (UICSM) . . . . . | 2 | 2.7 |
| National Trends in Mathematics . . . . . | 2 | 2.7 |
| Publishers of text books . . . . . | 3 | 4.1 |
| No reason given . . . . . | 3 | 4.1 |
| Combination of study groups, publishers and national trends . . . . . | 1 | 1.4 |

6 are tabulated in Table III. As early as the 1956-57 school year, one school introduced modern mathematics into its curriculum. Since this period, the number of schools introducing modern mathematics each year has remained fairly constant.

From the tabulations of the answers to item 7 we find the most popular method of introducing the modern mathematics into the regular mathematics curriculum has been on an orderly progression basis, that is by starting at one grade level and advancing modern mathematics with this group of students as they move through the school system. Table IV shows that the method most frequently used for introducing modern mathematics into the curriculum was to introduce modern mathematics in the seventh grade and progress through the system with this group. Eighteen, or 24.3 per cent, of the schools used this method. There were seventeen, or 23.0 per cent, of the schools which introduced modern mathematics into the curriculum at all levels the same year. A total of nine, or 12.2 per cent started their modern mathematics program with Algebra I and progressed with this group. There were seven, or 9.4 per cent, schools where the modern mathematics program was started on two levels, seventh grade and Algebra I in ninth grade, and progressed through the school system with both groups.

TABLE III

YEARS IN WHICH MODERN MATHEMATICS WAS INTRODUCED INTO THE CURRICULUM

| School year introduced | Number of schools | Per cent |
|---|---|---|
| 1956-57 . . . . . | 1 | 1.4 |
| 1958-59 . . . . . | 3 | 4.1 |
| 1959-60 . . . . . | 9 | 12.2 |
| 1960-61 . . . . . | 19 | 25.7 |
| 1961-62 . . . . . | 18 | 24.3 |
| 1962-63 . . . . . | 10 | 13.5 |
| 1963-64 . . . . . | 14 | 18.8 |

TABLE IV

METHOD BY WHICH MODERN MATHEMATICS WAS INTRODUCED INTO CURRICULUM

| Method of introducing modern math | Number of schools | Per cent |
|---|---|---|
| Seventh grade and progressed with this group | 18 | 24.3 |
| All levels the same year | 17 | 23.0 |
| Algebra I and progressed with this group | 9 | 12.2 |
| Seventh grade and Algebra I and progressed with these groups | 7 | 9.4 |
| Seventh and Eighth grades and progressed with these groups | 4 | 5.4 |
| Geometry | 4 | 5.4 |
| Accelerated group | 4 | 5.4 |
| Eighth grade and progressed with this group | 2 | 2.7 |
| Senior Mathematics | 2 | 2.7 |
| Algebra II | 2 | 2.7 |
| Algebra I and Algebra II | 2 | 2.7 |
| Seventh grade, Eighth grade and Algebra I | 2 | 2.7 |
| Eighth grade and Algebra I | 1 | 1.4 |

The results of item 8 showed that in the 1963-64 school year there were 292 teachers teaching modern mathematics in the schools which responded to the questionnaire. Some schools had only one teacher in the modern mathematics program, while other schools had as high as twelve teachers in their modern mathematics courses.

Table V shows how the teachers obtained their training in modern mathematics. Some of the 292 teachers received their training through more than one method; therefore, this accounts for the difference between the total number of teachers associated with the way they received their training in modern mathematics. Table V indicates that 154, or 37.1 per cent, of the teachers obtained their training in inservice institutes. There were 168 teachers, or 40.5 per cent, who obtained their training in modern mathematics by National Science Foundation Summer Institutes. There were 120, or 28.9 per cent, of these teachers who attended Summer Institutes in the universities and colleges in the State of Kansas, while forty-eight, or 11.6 per cent, attended Summer Institutes in universities or colleges in other states. There were forty-five, or 10.8 per cent, who obtained their training in a regular or summer semester at a university or college. The National Science Foundation has been of great value to the teachers in obtaining their training in modern mathematics. A total

TABLE V

METHODS USED BY TEACHERS TO OBTAIN THEIR TRAINING IN MODERN MATHEMATICS

| Method training obtained | Number of teachers | Per cent |
|---|---|---|
| Inservice Institutes . . . . . | 154 | 37.1 |
| National Science Foundation Summer Mathematics Institutes in Kansas . . | 120 | 28.9 |
| National Science Foundation Summer Mathematics Institutes other than in the state of Kansas . . . . . | 48 | 11.6 |
| Regular Summer School . . . . . | 42 | 10.1 |
| Regular College Semesters . . . . . | 35 | 8.4 |
| Self study by teachers . . . . . | 10 | 2.4 |
| Saturday classes in colleges . . . . . | 5 | 1.2 |
| Correspondence courses . . . . . | 1 | 0.2 |

of 372 or 76.6 per cent, teachers have attended institutes sponsored by the National Science Foundation.

Table VI shows the number of semester hours of college credit the teachers have in modern mathematics. There were 110, or 37.7 per cent, of the teachers who had six or less hours of college credit in modern mathematics. While there are sixty-seven of the teachers, or 22.9 per cent who had sixteen or more hours of college credit. The remaining 115 teachers, or 39.4 per cent, had between seven and fifteen hours in modern mathematics.

Item 11 through 17 were in reference to the per cent of students and the placement of Algebra I and the same information on geometry in an accelerated mathematics program. The word accelerated was not defined in the questionnaire. It was assumed that respondees would interpret the word as meaning the placement of mathematics topics earlier in the curriculum than their traditional placement. The responses to item 19 of the questionnaire indicate that seventy-two, or 97.8 per cent, of the schools first offer Algebra I, in their regular mathematics curriculum, at the ninth grade level; while the responses to item 12 of the questionnaire indicated that twenty-one, or 47.7 per cent, first offered Algebra I in the accelerated program at the ninth grade level. From the assumed definition of acceleration there would be some question as to the validity of

TABLE VI

NUMBER OF HOURS OF COLLEGE CREDITS OBTAINED IN MODERN MATHEMATICS BY TEACHERS

| Hours of college credit | Number of teachers | Per cent |
|---|---|---|
| 0 to 2 | 43 | 14.7 |
| 3 to 6 | 67 | 23.0 |
| 7 to 9 | 58 | 19.9 |
| 10 to 12 | 28 | 9.6 |
| 13 to 15 | 29 | 9.9 |
| 16 to 20 | 24 | 8.2 |
| Above 20 | 43 | 14.7 |

the section on the accelerated program.

The responses to item 11 of the questionnaire showed that forty-four, or 59.5 per cent, of the schools had an accelerated program, while thirty, or 40.5 per cent, schools did not offer an accelerated program.

The answers to item 12 of the questionnaire pertained to the grade level at which Modern Algebra I was first offered in the accelerated mathematics program. There was only one, or 2.3 per cent, of the schools which offered Modern Algebra I at the seventh grade level, while seventy-two, or 50.0 per cent, schools started the program in the eighth grade. The remaining twenty-one, or 47.7 per cent, of the schools first offered their accelerated mathematics program at the ninth grade level.

The answers to item 13 of the questionnaire indicated the per cent of students in the accelerated Algebra I program. Table VII shows that there were sixteen, or 36.4 per cent, of the schools which had from 11 to 20 per cent of their students in the accelerated Algebra I program. There were twelve, or 27.2 per cent, schools which had from 1-10 per cent of their students in accelerated Algebra I. The remainder of the schools varied from 3 per cent to 100 per cent of students in the accelerated program as shown in Table VII.

The responses to item 14 show that eighteen, or

TABLE VII

PER CENT OF PUPILS IN THE ACCELERATED ALGEBRA I MATHEMATICS PROGRAM

| Per cent of students | Number of schools | Per cent of schools |
|---|---|---|
| 1-10 | 12 | 27.2 |
| 11-20 | 16 | 36.4 |
| 21-30 | 2 | 4.6 |
| 31-40 | 6 | 13.6 |
| 41-50 | 2 | 4.6 |
| 51-60 | 2 | 4.6 |
| 61-70 | 1 | 2.2 |
| 71-80 | 1 | 2.2 |
| 81-99 | 0 | 0.0 |
| 100 | 2 | 4.6 |

40.9 per cent, of the schools that offered an accelerated Algebra I course, first offered geometry at the tenth grade level in their accelerated program. There were fifteen, or 34.1 per cent, schools which first offered the accelerated geometry program at the ninth grade level. The remaining eleven or 25.0 per cent, of the schools did not offer an accelerated geometry program.

The answers to item 15 of the questionnaire showed the per cent of students in the accelerated geometry course. Eleven, or 25.0 per cent, of the schools which offered an accelerated Algebra I program didn't offer an accelerated geometry program. There were eight, or 8.2 per cent, of the schools which had 11 to 20 per cent of their students in the accelerated geometry program as shown in Table VIII. There were ten, or 22.8 per cent, of the schools which had 1 to 10 per cent of their students in the accelerated geometry program while six, or 13.6 per cent, of the schools were represented in one of two groups, either 21 to 30 per cent or 31 to 40 per cent of their students were in the accelerated geometry program.

The responses to item 16 indicate that thirty-one, or 93.9 per cent, of the thirty-three schools which had the accelerated geometry program, offer plane and solid geometry as a combined course.

The responses to item 18 indicated the names of the

TABLE VIII

PER CENT OF PUPILS IN ACCELERATED GEOMETRY MATHEMATICS PROGRAM

| Per cent of students | Number of schools | Per cent of schools |
|---|---|---|
| None | 11 | 25 |
| 1-10 | 10 | 22.8 |
| 11-20 | 8 | 18.2 |
| 21-30 | 6 | 13.6 |
| 31-40 | 6 | 13.6 |
| 41-50 | 1 | 2.2 |
| 51-60 | 1 | 2.2 |
| 61-70 | 1 | 2.2 |

text books used in Algebra I. The text book most commonly used, as indicated in Table IX, was Modern Algebra, Book I by Dolciani. There were twenty, or 27.0 per cent, of the schools using this text book in their Modern Algebra I classes. Fourteen, or 18.9 per cent, of the schools indicated they used Modern Algebra I by Nichols in their Algebra I classes. A First Course in Algebra, the text book prepared by SMSG, was used in eleven, or 14.8 per cent, of the schools. The three text books listed above are the most popular, but there were ten other text books, as indicated in Table IX, being used by the schools in Algebra I.

The replies to item 19 of the questionnaire indicated that seventy-two, or 97.2 per cent, of the schools first offered Algebra I in their regular mathematics curriculum at the ninth grade level. There was one, or 1.4 per cent of the schools starting Algebra I at the eighth grade level, and the same number first offered Algebra I in their regular mathematics curriculum at the tenth grade level.

The answers to item 20 of the questionnaire indicated that Modern Algebra and Trigonometry Book II by Dolciani was used in nineteen, or 25.7 per cent, of the schools. This and other texts used in advanced mathematics have been shown in Table X. A Second Course in Algebra, the text book prepared by the SMSG, was used in nine, or

TABLE IX

TEXTBOOKS USED IN ALGEBRA I

| Algebra textbook | Author | Publisher copyright | No. of schools | Per cent |
|---|---|---|---|---|
| Modern Algebra, Book I . . . . . | Dolciani | Houghton-Mifflin, 1962 | 20 | 27.0 |
| Modern Algebra I . . | Nichols | Holt, 1961 | 14 | 18.9 |
| A First Course in Algebra . . . . . | SMSG | Yale University Press, 1961 | 11 | 14.8 |
| Algebra I, A Modern Course . . . . . | Vannatte | Merrill, 1962 | 5 | 6.7 |
| Modern Mathematics, Algebra I . . . . | Russkopf | Silver Burdett, 1962 | 4 | 5.4 |
| Algebra I . . . . . | Peters & Schant | Van Nostrand, 1961 | 4 | 5.4 |
| Algebra, First Course . . . . . | Mayor | Prentice Hall, 1961 | 2 | 2.7 |
| Algebra, Its Big Ideas and Basic Skills, Book I . . | Henderson | McGraw-Hill, 1960 | 3 | 4.1 |
| Algebra, Book I Modern Ectitin . . | Welchons | Ginn, 1962 | 2 | 2.7 |
| Discovering Structure in Algebra. . | Grossnickle | Holt, 1962 | 1 | 1.4 |
| Modern Algebra, First Course . . . | Johnson | Addison-Wesley, 1962 | 1 | 1.4 |
| Contemporary Algebra Book I . . . . . | Smith | Harcourt, Brace, 1962 | 1 | 1.4 |
| No Modern Algebra I | | | 6 | 8.1 |

TABLE X

TEXTBOOKS USED IN MODERN ALGEBRA II

| Algebra textbook | Author | Publisher copyright | No. of schools | Per cent |
|---|---|---|---|---|
| Modern Algebra and Trigonometry, Book II . . . . . | Dolciani | Houghton-Mifflin, 1963 | 19 | 25.7 |
| A Second Course in Algebra . . . . . | SMSG | Yale University Press, 1961 | 9 | 12.2 |
| Algebra Book II, Modern Edition . . | Welchons | Ginn, 1962 | 6 | 8.1 |
| Modern Algebra, Second Course . . | Johnson | Addison-Wesley, 1962 | 3 | 4.1 |
| Contemporary Algebra and Trigonometry . | Griswold | Holt, 1961 | 5 | 6.7 |
| Principles of Mathematics . . . | No given author | McGraw-Hill | 1 | 1.4 |
| Algebra, Second Course . . . . . | Mayor | Prentice Hall, 1961 | 2 | 2.7 |
| Algebra II . . . . . | Weeks | Ginn, 1962 | 2 | 2.7 |
| Algebra, Its Big Ideas and Basic Skills, Book II . | Henderson | McGraw-Hill, 1960 | 1 | 1.4 |
| A Second Course in Algebra . . . . | Mallory | Singer, 1962 | 1 | 1.4 |
| Algebra Two, A Modern Course . . | Vannatte | Merrill, 1962 | 4 | 5.4 |
| No Modern Algebra II classes | | | 21 | 28.3 |

12.2 per cent of the schools; while Algebra Book II Modern Edition by Welchons was used in six, or 8.1 per cent of the schools. There were eight other text books used in the Modern Algebra II curriculum as indicated in Table X.

There were fifty, or 67.6 per cent of the schools which first offered Algebra II, in their regular mathematics curriculum, at the eleventh grade level. This was determined by the answers to item 21 of the questionnaire. Six, or 8.1 per cent of the schools offered Algebra II at the tenth grade level. There were twenty-three, or 24.3 per cent of the schools which did not offer a Modern Algebra II course in their curriculum.

The answers to item 22 of the questionnaire indicated that there were fifteen, or 20.2 per cent of the schools which used Modern Geometry by Jurgensen in their regular geometry classes. The text books used in geometry have been shown in Table XI. There were ten, or 13.5 per cent, of the schools which used the text book prepared by SMSG, as their text book for geometry. Modern Geometry by Henderson, and Contemporary Geometry by Schacht were each used in five, or 6.7 per cent of the responding schools. There were five other text books used in the regular geometry class as indicated in Table XI.

The responses to item 23 of the questionnaire indicate that forty, or 54.1 per cent, of the schools offered

TABLE XI

TEXTBOOKS USED IN MODERN GEOMETRY

| Geometry textbook | Author | Publisher copyright | No. of schools | Per cent |
|---|---|---|---|---|
| Modern Geometry . . . | Jurgensen | Houghton-Mifflin, 1963 | 15 | 20.2 |
| Modern Geometry . . . | Henderson | McGraw-Hill, 1962 | 5 | 6.7 |
| Contemporary Geometry . . . . . | Schacht | Holt, 1962 | 5 | 6.7 |
| Geometry . . . . . | SMSG | Yale University Press, 1961 | 10 | 13.5 |
| Plane Geometry . . . | Morgan | Houghton-Mifflin, 1963 | 3 | 4.1 |
| Plane Geometry . . . | Welchons | Ginn, 1961 | 3 | 4.1 |
| Plane Geometry and Supplements . . . | Hart | Heath, 1959 | 1 | 1.4 |
| Geometry, A Unified Course . . . . . | Goodwin | Merrill, 1962 | 4 | 5.4 |
| Geometry . . . . . | Fehr | Heath, 1961 | 1 | 1.4 |
| No Modern Geometry classes | | | 27 | 36.5 |

a combined Plane and Solid Geometry course in their regular mathematics curriculum; while fifteen, or 20.2 per cent of the schools offered Plane and Solid Geometry as two separate courses. The remaining nineteen, or 25.7 per cent did not answer this item.

There were fifty-four, or 73.0 per cent, of the schools which first offered geometry in their regular mathematics curriculum, at the tenth grade level. This was indicated in the results of item 23 of the questionnaire. Two, or 2.7 per cent of the schools first offered geometry in their regular mathematics curriculum at the ninth grade level. The remaining 18, or 24.3 per cent did not answer this question.

In response to item 25, there were sixty-one, or 81.1 per cent of the schools which requested a summary of the report; while thirteen, or 18.1 per cent of the schools did not request a summary.

Of the twenty-one responding schools, which did not have modern mathematics in their curriculum, there were six, or 28.6 per cent of the schools which requested a summary. The remaining fifteen or 71.4 per cent did not request a summary. Therefore, of the ninety-five of the responding schools sixty-seven or 70.6 per cent of the schools requested a summary.

# SUMMARY

One hundred twenty-six questionnaires on modern mathematics were distributed to seventy comprehensive high schools and to fifty-six selected junior high schools within these systems. There were ninety-five of the questionnaires completed and returned for compilation; of the ninety-five returned there were seventy-four, or 77.9 per cent, which had modern mathematics in their curriculum.

Of the seventy-four schools which had modern mathematics in their curriculum, one school had introduced modern mathematics as early as the 1956-57 school year. The greatest upsurge in popularity occurred in the school years of 1960-61 and 1961-62. During this period 50 per cent of the schools introduced modern mathematics into their curriculum. Since this period the number of schools introducing modern mathematics into their curriculum has been fairly constant.

The persons which motivated the change to modern mathematics were primarily the mathematics teachers. In twenty-five, or 33.8 per cent, of the schools the mathematics teachers were the sole motivating influence. The mathematics teachers, either alone or working with supervisory personnel, were involved in a total of sixty-one, or 82.6 per cent, of the schools in making the change to

modern mathematics.

SMSG was the study group which had exerted the greatest influence on our modern mathematics curriculum. The SMSG was cited, either solely or in conjunction with the other study groups or commissions, by sixty-three, or 85.2 per cent, of the schools as the group which had the most influence on the modern mathematics curriculum.

With the introduction of modern mathematics into the curriculum there was also introduced a problem of teacher training. Modern mathematics did not contain any new concepts to mathematicians, but to the mathematics teachers there was a need for further training in many cases. The National Science Foundation provided the means by which the majority of the teachers obtained their training. There were 154, or 37.7 per cent, of the teachers who received training through the inservice institutes, and 168, or 40.5 per cent, who received training in National Science Foundations Summer Mathematics Institutes. These institutes were supported by funds furnished by the federal government.

Even with the work of the National Science Foundation there still remains a problem in teacher training in modern mathematics, since 110, or 37.7 per cent, of the teachers, who were teaching modern mathematics, had six or less hours of college credit in modern mathematics.

Not only has the National Science Foundation helped

teachers return to school for mathematics training, but they have supported study groups in preparing subject matter for our mathematics curriculum. These study groups have in turn influenced the authors and publishers of our mathematics text books. The most popular text book used by the schools surveyed was Modern Algebra I by Dolciani. There were twenty, or 27.0 per cent, of the schools using this text book in their Algebra I classes. The SMSG algebra text books were used in eleven, or 14.8 per cent, of the schools. Fourteen, or 18.9 per cent, of the schools used Modern Algebra I by Nichols in their Algebra I classes.

In Algebra II the most popular text was Modern Algebra and Trigonometry Book II by Dolciani. This book was used in nineteen, or 25.7 per cent, of the schools. A Second Course in Algebra, the text book prepared by SMSG, was used in nine, or 12.2 per cent of the schools; while Algebra Book II Modern Edition by Welchons was used in six, or 8.1 per cent, of the schools.

In geometry the most popular text book was Modern Geometry by Jurgensen. This book was used by fifteen, or 20.2 per cent, of the schools. The text book prepared by SMSG was used by ten, or 13.5 per cent, of the schools in their geometry classes. Modern Geometry by Henderson, and Contemporary Geometry by Schacht were each used in five, or 6.7 per cent, of the responding schools.

The responding schools were in accord in regard to the offering of Algebra I at the ninth grade level; seventy-two, or 97.2 per cent, of the schools had Algebra I at that grade level. There were fifty, or 67.6 per cent, of the schools who first offered Algebra II at the eleventh grade level; while fifty-five, or 73.0 per cent, of the schools offered geometry at the tenth grade level.

In this report it has been shown that modern mathematics is increasingly being added to the curriculum in the schools of Kansas. Attendant to this addition have been problems of scope, sequence, and teacher preparation. A modern mathematics curriculum is more demanding than the traditional curriculum; therefore, if the trend determined by this report continues, then schools may expect to encounter increased problems in its implementation.

## ACKNOWLEDGMENTS

The writer would like to express his sincere thanks to Dr. J. Harvey Littrell, major adivser in this study, for his valuable assistance, constructive criticism, and more especially for the personal interest during the writing of this report.

The writer, also, wishes to express his appreciation to the administrators and the mathematics teachers who took their time to complete and return the questionnaires; without which the report could not have been compiled.

The writer wishes to express thanks to his wife, Stella, for the cooperation and understanding during the writing of this report.

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# APPENDIX

Paola, Kansas
October 8, 1963

I am making a study of the extent to which modern mathematics is being taught in the comprehensive high schools in the state of Kansas. This study is under the immediate supervision of Dr. J. Harvey Littrell, Associate Professor, School of Education, Kansas State University. It is felt that the information gained by this study can be of real value to administrators as well as mathematic departments.

I would appreciate it if you would give this questionnaire to a member of your mathematics staff who would best know the mathematics program in your high school.

Sincerely yours,

Blenard C. Wilson

BCW:cp
Encl.:questionnaire

Paola, Kansas
October 8, 1963

Dear Mathematics Teacher:

For the past three years Kansas State University, in conjunction with the National Science Foundation, has sponsored summer institutes devoted to improving the preparation of secondary school mathematics teachers. The courses are designed to prepare the teacher to handle the Modern Mathematics. As a former member of the institute, I am interested in determining just what is being done in the state of Kansas in Modern Mathematics.

This study, under the immediate supervision of Dr. J. Harvey Littrell, Associate Professor in the School of Education at Kansas State University, has the following purposes: to determine the number of comprehensive high schools offering modern mathematics in their curriculum; to ascertain the training of the teachers in the modern mathematics; to determine the forces motivating the change; to discover how long modern mathematics has been in the curriculum as well as how it was introduced into the curriculum; to discover at what grade levels Modern Algebra 1, 2, and Modern Geometry are placed in the curriculum; and to determine the degree from the traditional the curriculum has digressed. This survey is being conducted in all the comprehensive secondary schools in the state of Kansas.

It is not necessary to identify yourself on the questionnaire unless you wish to receive a summary of the results of this study. Please return the completed questionnaire in the enclosed self-addressed envelope.

Sincerely yours,

Blenard C. Wilson

BCW:cp
Encl.:questionnaire

A Study of the Modern Algebra 1, Modern Algebra 2, and Modern Geometry offered in the Comprehensive High Schools in the State of Kansas.

Definition -- In this study, the term Modern Mathematics will be used in reference to the concepts and methods of presenting concepts in mathematics recommended by Study Groups and National or University Committees as best satisfying the needs of our modern society.

Examples -- A. School Mathematics Study Group (SMSG)
B. University of Illinois Committee on School Mathematics (UICSM)
C. College Entrance Examination Board's Commission on Mathematics

1. Does your mathematics curriculum contain modern mathematics courses?

1.1 Yes _____
1.2 No _____

If your answer is "no", you do not need to proceed with this questionnaire. Please return the questionnaire in the self-addressed, stamped envelope provided.

If your answer is "yes", please answer the following questions.

General Information

2. Which person or persons were primarily responsible for motivating the change to modern mathematics?

Check one or more of the following:

| | | |
|---|---|---|
| 2.1 | Superintendent of Schools | 2.1 _____ |
| 2.2 | Principal of Jr. High School | 2.2 _____ |
| 2.3 | Principal of Sr. High School | 2.3 _____ |
| 2.4 | Curriculum Director | 2.4 _____ |
| 2.5 | Mathematics Teacher | 2.5 _____ |
| 2.6 | Others (Please list) | 2.6 _____ |
| | | 2.7 _____ |
| | | 2.8 _____ |

3. Was an outside pressure group responsible for the change to modern mathematics?

3.1 Yes ____
3.2 No ____

4. If your answer to number three is "yes", what group was instrumental in motivating the change?

| | | |
|---|---|---|
| 4.1 | Parents Teachers Association | 4.1 _____ |
| 4.2 | Pressure from colleges | 4.2 _____ |
| 4.3 | Public Opinion | 4.3 _____ |
| 4.4 | Others (Pleast list) | . . |
| | | 4.4 _____ |
| | | 4.5 _____ |

5. What study group or committee had the most influence on your modern mathematics curriculum?

| | | |
|---|---|---|
| 5.1 | School Mathematics Study Group (SMSG) | 5.1 _____ |
| 5.2 | University of Illinois Committee on School Mathematics (UICSM) | 5.2 _____ |
| 5.3 | College Entrance Examination Board's Commission on Mathematics | 5.3 _____ |
| 5.4 | Ball State Teachers College Experimental Project | 5.4 _____ |
| 5.5 | University of Maryland Mathematics Project | 5.5 _____ |
| 5.6 | Others (Please list) | |
| | | 5.6 _____ |
| | | 5.7 _____ |

6. What school year was modern mathematics introduced into your curriculum?

| | | |
|---|---|---|
| 6.1 | 1959-1960 | 6.1 _____ |
| 6.2 | 1960-1961 | 6.2 _____ |
| 6.3 | 1961-1962 | 6.3 _____ |
| 6.4 | 1962-1963 | 6.4 _____ |
| 6.5 | 1963-1964 | 6.5 _____ |
| 6.6 | Others (Please list) | |
| | | 6.6 _____ |
| | | 6.7 _____ |

7. How was the new mathematics introduced into your regular mathematics curriculum?

| | | |
|---|---|---|
| 7.1 | Seventh grade and progressed with this group | 7.1 _____ |
| 7.2 | Algebra 1 and progressed with this group | 7.2 _____ |
| 7.3 | At both Seventh grade and Algebra 1 and progressed with these groups | 7.3 _____ |
| 7.4 | In all levels the same year | 7.4 _____ |
| 7.5 | In other methods (Please explain) | 7.5 _____ |
| | | 7.6 _____ |

8. How many teachers do you have teaching modern mathematics?

| | | |
|---|---|---|
| | (Please give number) | 8.1 _____ |

9. How did the teachers obtain their training in modern mathematics?

| | | Number of teachers |
|---|---|---|
| 9.1 | Inservice Institutes | 9.1 _____ |
| | National Science Foundation Summer Mathematics Institutes | |
| 9.2 | (In Kansas) | 9.2 _____ |
| 9.3 | (In other states) | 9.3 _____ |
| 9.4 | Regular Summer School | 9.4 _____ |
| 9.5 | Regular College Semesters | 9.5 _____ |
| 9.6 | Others (Please list) | 9.6 _____ |
| | | 9.7 _____ |

10. The number of hours of college credit your teachers have in modern mathematics.

| | Hours of Credit | Numbers of teachers |
|---|---|---|
| 10.1 | 3 to 6 | 10.1 _____ |
| 10.2 | 7 to 9 | 10.2 _____ |
| 10.3 | 10 to 12 | 10.3 _____ |
| 10.4 | 13 to 15 | 10.4 _____ |
| 10.5 | 15 to 20 | 10.5 _____ |
| 10.6 | above 20 | 10.6 _____ |

## Accelerated Program Information

11. Do you have an accelerated mathematics program for your gifted students?

11.1 Yes ___
11.2 No ___

If your answer was "no", please go to question # 18; if your answer was "yes", answer questions 12-17 and then proceed to # 18.

12. At what level do you offer Modern Algebra 1 in this program?

12.1 Seventh grade 12.1 _____
12.2 Eighth grade 12.2 _____
12.3 Ninth grade 12.3 _____
12.4 Others (Please list)
12.4 _____
12.5 _____

13. What per cent of the pupils in the grade level are in Modern Algebra 1?

13.1 _____

14. At what grade level do you offer Modern Geometry in your accelerated program?

14.1 Eighth grade 14.1 _____
14.2 Ninth grade 14.2 _____
14.3 Tenth grade 14.3 _____
14.4 Other (Please state)
14.4 _____

15. What per cent of the pupils in the level checked are in Modern Geometry Grade?

15.1 _____

16. Is Geometry a combined Plane Geometry and Solid Geometry in your accelerated program?

16.1 Yes ___
16.2 No ___

17. At what grade level do you offer Modern Algebra 2 in your accelerated program?

| | | |
|---|---|---|
| 17.1 | Ninth grade | 17.1 _____ |
| 17.2 | Tenth grade | 17.2 _____ |
| 17.3 | Eleventh grade | 17.3 _____ |
| 17.4 | Other (Please state) | 17.4 _____ |

## Algebra 1 Information

18. Please check the text book or books you use in Modern Algebra 1, and if you use more than one, please explain in space provided.

| | Algebra 1 Text Book | Author | Publisher Copywrite | |
|---|---|---|---|---|
| 18.1 | Modern Algebra--First Course | Johnson | Addison-Wesley 1961 | 18.1 ___ |
| 18.2 | Algebra I | Hayden | Allynand Bacon 1961 | 18.2 ___ |
| 18.3 | Algebra Book One Modern Edition | Welchons | Ginn 1962 | 18.3 ___ |
| 18.4 | Contemporary Algebra Book One | Smith | Harcourt, Brace 1962 | 18.4 ___ |
| 18.5 | New First Algebra | Hart | Heath 1962 | 18.5 ___ |
| 18.6 | Algebra, Course I, Second Edition | Fehr | Heath 1962 | 18.6 ___ |
| 18.7 | Modern Elementary Algebra | Nichols | Holt 1961 | 18.7 ___ |
| 18.8 | Modern Algebra Book One | Dolciani | Houghton-Mifflin 1962 | 18.8 ___ |
| 18.9 | Algebra One, A Modern Course | Vannatta | Merrill 1962 | 18.9 ___ |
| 18.10 | Algebra, Its Big Ideas and Basic Skills Book I | Henderson | McGraw-Hill 1960 | 18.10___ |
| 18.11 | Modern Mathematics, Algebra I | Rosskopf | Silver Burdett 1962 | 18.11___ |
| 18.12 | Algebra in Easy Steps with Modern Units | Stem | Van Nostrand 1961 | 18.12___ |
| 18.13 | Algebra--First Course | Brown | Laidlaw 1963 | 18.13___ |
| 18.14 | Others (Pleast list) | | | 18.14___ |

Please explain here if more than one Modern Algebra I text book is used in your program.

19. On what grade level is Algebra I first offered in your regular mathematics curriculum?

| | | |
|---|---|---|
| 19.1 | Ninth grade | 19.1 _____ |
| 19.2 | Tenth grade | 19.2 _____ |
| 19.3 | Other (Please list) | 19.3 _____ |

## Algebra 2 Information

20. Please check the text book or books you use in Modern Algebra 2, and if more than one is used please explain in space provided.

| | Algebra 2 Text Book | Author | Publisher - Copywrite | |
|---|---|---|---|---|
| 20.1 | Modern Algebra-Second Course | Johnson | Addison-Wesley 1962 | 20.1____ |
| 20.2 | Algebra Book 2 Modern Edition | Welchons | Ginn 1962 | 20.2____ |
| 20.3 | New Second Algebra | Hart | Heath 1962 | 20.3____ |
| 20.4 | Contemporary Algebra and Trigonometry | Griswold | Holt 1961 | 20.4____ |
| 20.5 | Modern Algebra and Trigonometry Book 2 | Dolciani | Houghton-Mifflin 1963 | 20.5____ |
| 20.6 | Algebra, Its Big Ideas and Basic Skills, Book 2 | Henderson | McGraw-Hill 1960 | 20.6____ |
| 20.7 | Algebra-Second Course | Brown | Laidlaw 1963 | 20.7____ |
| 20.8 | Others (Please list) | | | 20.8____ |

Please explain here if more than one Modern Algebra 2 text book is used in your program.

21. On what grade level is Modern Algebra 2 first offered in your regular mathematics curriculum?

| | | |
|---|---|---|
| 21.1 | Ninth grade | 21.1 _____ |
| 21.2 | Tenth grade | 21.2 _____ |
| 21.3 | Eleventh grade | 21.3 _____ |
| 21.4 | Other (Please list) | 21.4 _____ |

22. Please check the text book or books used in your Modern Geometry classes.

| | Geometry Book Title | Author | Publisher - Copywrite | |
|---|---|---|---|---|
| 22.1 | High School Geometry | Keniston | Ginn 1960 | 22.1____ |
| 22.2 | Geometry | Fehr | Heath 1961 | 22.2____ |
| 22.3 | Plane Geometry | Morgan | Houghton-Mifflin 1963 | 22.3____ |
| 22.4 | Contemporary Geometry | Schacht | Holt 1962 | 22.4____ |
| 22.5 | Geometry Plane and Solid | Brown | Laidlaw 1962 | 22.5____ |
| 22.6 | Modern Geometry | Henderson | McGraw-Hill 1962 | 22.6____ |
| 22.7 | Geometry, A Unified Course | Goodwin | Merril 1962 | 22.7____ |
| 22.8 | Others (Please list) | | | 22.8____ |

23. Do you offer a combined Modern Plane and Solid Geometry course for students other than those in the accelerated program?

23.1 Yes _____
23.2 No _____

24. On what grade level do you first offer Modern Geometry in your regular mathematics curriculum?

| | | |
|---|---|---|
| 24.1 | Ninth grade | 24.1 _____ |
| 24.2 | Tenth grade | 24.2 _____ |
| 24.3 | Eleventh grade | 24.3 _____ |
| 24.4 | Other (Please list) | 24.4 _____ |

25. Do you wish to receive a summary of the results of this study?

25.1 Yes _____
25.2 No _____

If so, please print your name and address on the lines provided below.

_____

_____

_____

Thank you for completing the questionnaire. Any future correspondence pertaining to this study should be addressed to:

Blenard C. Wilson
602 East Kaskaskia
Paola, Kansas

List of schools to which the questionnaire was mailed in order of appearance in KANSAS EDUCATIONAL DIRECTORY 1963-64.

Abilene High School
Abilene Junior High School
Labette County Community High School
Arkansas City High School
Arkansas City Junior High School
Atchinson High School
Atchinson Junior High School
Augusta High School
Augusta Junior High School
Bonner Springs High School
Buhler High School
Campus High School
Chanute High School
Chanute Junior High School
Dickinson County Community High School
Coffeyville High School
Coffeyville Junior High School
Thomas County Community High School
Columbus Rural High School
Derby High School
Carlton Junior High School
Derby Junior High School
Dodge City High School
Dodge City Junior High School
El Dorado High School
El Dorado Junior High School
Ellinwood High School
Emporia High School
Emporia Junior High School
Fort Scott High School
Fort Scott Junior High School
Garden City High School
Garden City Junior High School
Girard Rural High School
Harrison Junior High School
Roosevelt Junior High School
Great Bend Rural High School
Hays High School
Hugoton High School
Hutchinson High School
Central Junior High School
Liberty Junior High School
Sherman Junior High School
Independence High School
Independence Junior High School

Iola High School
Iola Junior High School
Junction City High School
Junction City Junior High School
Argentine High School
Rosedale High School
Sumner High School
Wyandotte High School
Central Junior High School
Northeast Junior High School
Northwest Junior High School
Kingman High School
Lakin High School
Lawrence High School
Central Junior High School
West Junior High School
Leavenworth High School
Leavenworth Junior High School
Liberal High School
Central Junior High School
West Junior High School
Manhattan High School
Manhattan Junior High School
McPherson High School
McPherson Junior High School
Neodesha High School
Newton High School
Chisholm Junior High School
Santa Fe Junior High School
Olathe High School
Olathe Junior High School
Ottawa High School
Ottawa Junior High School
Paola High School
Parsons High School
Parsons Junior High School
Pittsburg High School
Lakeside Junior High School
Pratt High School
Pratt Junior High School
Russell Rural High School
Russell Junior High School
Salina High School
Roosevelt Junior High School
Salina South Junior High School
Scott City Junior High School
Scott County Community High School
Seaman High School
Northern Hills Junior High School

Shawnee Missions East High School
Shawnee Missions North High School
Shawnee Missions West High School
Broadmoor Junior High School
Hillcrest Junior High School
Indian Hills Junior High School
Southeast Rural High School
Highland Park High School
Topeka High School
Topeka West High School
Boswell Junior High School
Capper Junior High School
Jardine Junior High School
Turner High School
Washburn High School
Washington High School
Arrowhead Junior High School
Coronado Junior High School
Wellington High School
Wellington Junior High School
Wichita East High School
Wichita Heights High School
Wichita North High School
Wichita South High School
Wichita Southeast High School
Wichita West High School
Curtis Junior High School
Marshall Junior High School
Meade Junior High School
Roosevelt Junior High School
Winfield High School
Roosevelt Junior and Senior High School

# MODERN MATHEMATICS IN THE COMPREHENSIVE HIGH SCHOOLS AND SELECTED JUNIOR HIGH SCHOOLS IN KANSAS

by

BLENARD C. WILSON

B. S., Kansas State University, 1960

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AN ABSTRACT OF A MASTER'S REPORT

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

School of Education

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1965

The purposes of this study were (1) to determine the extent to which modern mathematics is being offered; (2) to ascertain the training of the teachers in modern mathematics; (3) to determine the forces motivating the change; (4) to discover how long modern mathematics has been in the curriculum and the method by which it was introduced; and (5) to discover at what grade levels Modern Algebra I and II and Modern Geometry were placed in the curriculum.

One hundred twenty-six questionnaires on modern mathematics were distributed to seventy comprehensive high schools and to fifty-six selected junior high schools within these systems. There were ninety-five of the questionnaires completed and returned for compilation; of the ninety-five returned there were seventy-four, or 77.9 per cent, of the schools which had modern mathematics in their curriculums.

The persons who motivated the change to modern mathematics were primarily the mathematics teachers. In twenty-five, or 33.8 per cent, of the schools the mathematics teachers were the sole motivating influence. The mathematics teachers, either alone or working with supervisory personnel, were involved in sixty-one, or 82.6 per cent, of the schools in making the change to modern mathematics.

Of the seventy-four schools which had modern mathematics in their curriculums, one school had introduced modern mathematics as early as the 1956-57 school year.

The greatest upsurge in popularity occurred in the school years of 1960-61 and 1961-62. During this period 50 per cent of the schools introduced modern mathematics into their curriculums. Since this period the number of schools introducing modern mathematics into their curriculums has been fairly constant.

The most popular method of introducing modern mathematics into the curriculum has been on an orderly progression basis, that is, by starting at one grade level and advancing modern mathematics with this group of students as they moved through the school system. Eighteen, or 24.3 per cent, of the schools introduced modern mathematics at the seventh grade level and progressed with this group. There were seventeen, or 23.0 per cent, of the schools which introduced modern mathematics into the curriculum at all levels the same year. There were seven, or 9.4 per cent, of the schools where the modern mathematics program was started on two levels, seventh grade and Algebra I in the ninth grade, and progressed with these groups. Nine, or 12.2 per cent, started their modern mathematics program with Algebra I and progressed with this group.

With the introduction of modern mathematics into the curriculum there was also introduced a problem of teacher training. Modern mathematics did not contain any new concepts to mathematicians, but for the mathematics

teachers there was a need for further training in many cases. The National Science Foundation provided the means by which the majority of the teachers obtained their training. There were 154, or 37.7 per cent, of the teachers who received training through inservice institutes, and 168, or 40.5 per cent who received training in National Science Foundations Summer Mathematics Institutes. Even with the work of this group, there is still a problem in teacher training in modern mathematics since 110, or 37.7 per cent, of the teachers had six or fewer hours of college credit in modern mathematics.

The responding schools were in accord in offering Modern Algebra I at the ninth grade level. Seventy-two, or 97.2 per cent, of the schools had Algebra I at this grade level. There were fifty, or 67.6 per cent, of the schools which first offered Algebra II at the eleventh grade level; while fifty-five or 73.0 per cent, of the schools first offered geometry at the tenth grade level.

Modern mathematics is increasingly being added to the curriculums in the schools in Kansas. Attendant to this addition have been problems of scope, sequence, and teacher preparation. A modern mathematics curriculum is more demanding than the traditional curriculum, therefore if the trend continues, schools may expect to encounter increased problems in its implementation.